DESCRIPTION

TITLE OF THE INVENTION: STORAGE APPARATUS

TECHNICAL FIELD

[0001] The invention relates to a storage apparatus including storage units capable of storing items, doors for opening and closing the storage units, locking devices capable of performing a first switching operation of switching from a locked state in which the door is locked to an unlocked state in which the door is unlocked and a second switching operation of switching from the unlocked state to the locked state, an operating unit that receives an operation by a user, and a controller that controls the locking devices in response to the operation received on the operating unit.

BACKGROUND ART

[0002] Conventionally, as storage apparatuses for temporarily storing and keeping users' items, locker apparatuses installed in railway stations and delivery lockers installed in apartment buildings have been widely used. For example, Patent Document 1 discloses a locker apparatus provided with storage units capable of storing items, doors for opening and closing the storage units, locking devices for locking or unlocking the doors, and an operating unit for receiving users' operations.

RELATED ART DOCUMENTS

PATENT DOCUMENTS

[0003] Patent Document 1: Japanese unexamined patent application publication No. 2006-2383350

SUMMARY OF INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0004] In the conventional storage apparatuses described above, the door of a

storage unit is generally left unlocked while no item is stored in the storage unit. Therefore, the storage unit on standby may be used improperly; for example, an item is placed in the storage unit without payment of a fee (with the door remains unlocked) or trash or rubbish is discarded in the storage unit.

[0005] The present disclosure has been made to address the above problems and has a purpose to provide a storage apparatus configured to suppress improper use of storage units on standby.

MEANS OF SOLVING THE PROBLEMS

[0006] To achieve the above-mentioned purpose, one aspect of the present disclosure provides a storage apparatus configured as below.

[0007] (1) A storage apparatus includes: a storage unit capable of storing an item; a door for opening and closing the storage unit; a locking device capable of performing a first switching operation of switching from a locked state in which the door is locked to an unlocked state in which the door is unlocked and a second switching operation of switching from the unlocked state to the locked state; an operating unit that receives an operation by a user; and a controller that controls the locking device in response to the operation received on the operating unit, characterized in that the storage unit has a standby mode of waiting with no item stored in the storage unit and a storage mode of waiting with an item stored in the storage unit, and the door is in the locked state during the standby mode.

[0008] (2) In the storage apparatus described in (1), preferably, the locking device includes restricting means that implements restriction of the first switching operation in the locked state, first drive means that drives the restricting means to implement or release the restriction, and second drive means for performing the first switching operation, the storage apparatus includes first detecting means that detects an open/closed state of the door and second detecting means that detects that the second switching operation is performed, the controller stores a storage program

configured to: activate the first drive means to release the restriction by the restricting means and activate the second drive means to perform the first switching operation, when the operating unit receives an operation for entering the storage mode during the standby mode; activate the first drive means to implement the restriction by the restricting means when the first detecting means detects that the door is closed and the second detecting means detects that the second switching operation is performed, and, until a first predetermined time elapses, enable the operating unit to receive a re-unlocking operation for releasing the restriction by the first drive means and causing the second drive means to perform the first switching operation again; and disable the re-unlocking operation from being received when the first predetermined time elapses, and switch the storage unit to the storage mode.

[0009] (3) In the storage apparatus described in (2), preferably, the second drive means is able to perform the second switching operation, and the storage program is configured to activate the second drive means to perform the second switching operation after a second predetermined time elapses from when the first detecting means detects that the door is closed.

[0010] (4) In the storage apparatus described in (1), preferably, the locking device includes restricting means that implements restriction of the first switching operation in the locked state, first drive means that drives the restricting means to implement or release the restriction, and second drive means for performing the first switching operation, the storage apparatus includes first detecting means that detects an open/closed state of the door and second detecting means that detects that the second switching operation is performed, the controller stores a retrieval program configured to: activate the first drive means to release the restriction by the restricting means and activate the second drive means to perform the first switching operation, when the operating unit receives an operation for retrieving the item during the storage mode; and activate the second drive means to perform the second switching operation when the first detecting means detects that the door is closed, and enable the first

switching operation to be manually performed until a third predetermined time elapses from when the second detecting means detects that the second switching operation is performed.

[0011] (5) In the storage apparatus described in (4), preferably, the retrieval program is configured to: activate the first drive means to implement the restriction by the restricting means when the third predetermined time elapses, enable the operating unit to receive a re-unlocking operation for releasing the restriction by the first drive means and causing the second drive means to perform the first switching operation again, until a fourth predetermined time elapses; and disable the re-unlocking operation from being received when the fourth predetermined time elapses, and switch the storage unit to the standby mode.

EFFECTS OF THE INVENTION

[0012] The storage apparatus of the invention is configured such that the door of a storage unit on standby is in a locked state, and therefore can suppress that improper use of the storage unit on standby.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] [FIG. 1] is a front view of a locker apparatus.

[FIG. 2] is an electric structure of the locker apparatus.

[FIG. 3] is a partial enlarged view of a part A in FIG. 1.

[FIG. 4] is a cross-sectional view taken along a line B-B in FIG. 3, showing a state in which a door is in a locked state.

[FIG. 5] is a cross-sectional view of a locking device, similar to FIG. 4, showing a state in which a switching lever is released from restriction.

[FIG. 6] is a cross-sectional view of the locking device, similar to FIG. 4, showing a state in which the switching lever is in an unlocking position and the door is in an unlocked state.

[FIG. 7] is a cross-sectional view of the locking device, similar to FIG. 4, showing a state in which the door is opened.

[FIG. 8A] is a flowchart of a storage program.

[FIG. 8B] is a flowchart of the storage program.

[FIG. 9A] is a flowchart of the storage program.

[FIG. 9B] is a flowchart of the storage program.

[FIG. 10] is a cross-sectional view of the locking device, similar to FIG. 4, showing a state in which emergency unlocking is performed.

[FIG. 11A] is a cross-sectional view taken along a line C-C in FIG. 10, showing a normal usage state of the locking device.

[FIG. 11B] is a cross-sectional view taken along the line C-C in FIG. 10, showing a state in which the locking device is subjected to emergency unlocking.

[FIG. 11C] is a cross-sectional view taken along the line C-C in FIG. 10, showing a state in which the locking device can be removed from a casing frame.

[FIG. 12] is a front view of the locking device corresponding to a right-hand door.

[FIG. 13A] is a left side view of a hook.

[FIG. 13B] is a front view of the hook.

[FIG. 13C] is a right side view of the hook.

MODE FOR CARRYING OUT THE INVENTION

[0014] A detailed description of a locker apparatus 1 according to an embodiment of a storage apparatus of the present invention will now be given referring to the accompanying drawings. FIG. 1 is a front view of the locker apparatus 1. FIG. 2 is an electric structure of the locker apparatus 1. FIG. 3 is a partial enlarged view of a part A in FIG. 1. FIG. 4 is a cross-sectional view taken along a line B-B in FIG. 3, showing a state in which a door 12 is in a locked state. FIG. 5 is a cross-sectional view of a locking device 20, similar to FIG. 4, showing a state in which a switching

lever 24 is released from restriction. FIG. 6 is a cross-sectional view of the locking device 20, similar to FIG. 4, showing a state in which the switching lever 24 is in an unlocking position and the door 12 is in an unlocked state. FIG. 7 is a cross-sectional view of the locking device 20, similar to FIG. 4, showing a state in which the door 12 is opened.

[0015] (Configuration of Locker Apparatus)

The locker apparatus 1 according to the present embodiment is installed, for example, in a railway station and used to temporarily store and keep one or more pieces of baggage, or personal items. The locker apparatus 1 has a plurality of storage units 10 capable of storing baggage of users. Specifically, two structures (locker structures 2) each including a total of ten storage units 10 arranged in five rows and two columns are placed with an operating unit 30 interposed therebetween. The number of storage units 10 is merely an example and may be increased or decreased as needed. In the present embodiment, all the storage units 10 have the same opening width, but this is also merely an example. As an alternative, storage units may have different opening widths.

[0016] The storage units 10 each have, on the front, a door 12 that can be opened and closed independently for each storage unit 10. The doors 12 of the storage units 10 located on the left side of the operating unit 30 are left-hand doors, which are opened to the left in the figure when respective handles 122 are pulled. The doors 12 of the storage units 10 located on the right side of the operating unit 30 are right-hand doors, which are opened to the right in the figure when respective handles 122 are pulled. For the left-hand doors 12, the locking devices 20 are provided on casing frames 11 on the right side of the relevant doors 12 to lock or unlock the doors 12. On the other hand, for the right-hand doors 12, the locking devices 20 are provided on casing frames 11 on the left side of the relevant doors 12. The configuration of the locking devices 20 will be described later.

[0017] In the locker apparatus 1, the operating unit 30 is provided between the

right and left locker structures 2, 2 to allow users to place their baggage into the storage units 10 and pick up the baggage therefrom, and pay a fee, by operating the operating unit 30. In the present embodiment, the storage units 10 are also provided below the operating unit 30, and they may be used as the space for storing maintenance tools for administrators.

[0018] The operating unit 30 includes, for example, a display unit 32, such as a touch panel, a printer 38 for printing receipts for verification of use, an IC card reader 40 for reading IC tags embedded in IC cards, and others. Here, the IC cards refer to cards that can be used for settlement with electronic money, such as transportation IC cards.

[0019] (Locking Device)

The locking devices 20 each include a rectangular parallelepiped case 21, as shown in FIGs. 3 to 7. Each case 21 internally includes, mainly, a first solenoid 22 (one example of first drive means), a second solenoid 23 (one example of second drive means), a switching lever 24, a lever lock plate 25 (one example of restricting means), a hook 26, a locking lever 27, an open/close switch lever 28, a first switch 41 (one example of first detecting means), a second switch 42 (one example of second detecting means), and a third switch 43. In FIGs. 4 to 7, the second switch 42 and the third switch 43 are positioned overlapping each other in the depth direction of the figures.

[0020] Furthermore, the locking device 20 includes a green LED 45 that emits green light and an orange LED 46 that emits orange light in order to indicate the usage status of the storage unit 10. Their externally visible parts in FIG. 3 are lens members covering light-emitting elements, and the light-emitting elements are built in the corresponding lens members.

[0021] The first solenoid 22 is configured such that a plunger 221 protrudes from a frame 222 when power supply is turned off, and the plunger 221 retracts into the frame 222 when power supply is turned on. The lever lock plate 25 is connected to

the tip of the plunger 221. As the plunger 221 protrudes and retracts, the lever lock plate 25 is rotated about a rotary shaft 251.

[0022] The lever lock plate 25 is provided with a restricting part 252 for restricting, i.e., preventing, the movement of the switching lever 24, and is turned between a restriction position at which the restricting part 252 restricts the movement of the switching lever 24 and a release position at which the restriction by the restricting part 252 is released. FIG. 4 shows the lever lock plate 25 located in the restriction position and FIGs. 5 to 7 show the lever lock plate 25 located in the release position.

[0023] Near the lever lock plate 25, the third switch 43 is provided. When the lever lock plate 25 is rotated from the restriction position to the release position, the restricting part 252 presses a lever 431 of the third switch 43, turning on the third switch 43. On the other hand, when the lever lock plate 25 is rotated from the release position to the restriction position, the restricting part 252 moves away from the third switch 43, turning off the third switch 43. Based on the ON/OFF operation of the third switch 43, it is possible to detect whether the lever lock plate 25 is located in the release position or the restriction position.

[0024] The switching lever 24 is a lever for switching the door 12 between the locked state and the unlocked state, and is rotatable about a rotary shaft 241 between a locking position for placing the door 12 in the locked state and an unlocking position for placing the door 12 in the unlocked state. The switching lever 24 shown in FIGs. 4 and 5 is located in the locking position, and the switching lever 24 shown in FIGs. 6 and 7 is located in the unlocking position.

[0025] The switching lever 24 is provided with a lock pin 244. For example, as shown in FIG. 4, while the switching lever 24 is located in the locking position and the lever lock plate 25 is located in the restriction position, even if a user attempts to turn the switching lever 24 to the unlocking position, the restricting part 252 of the lever lock plate 25 is located in the path of movement of the switching lever 24, preventing the switching lever 24 from rotating to the unlocking position. In contrast,

as shown in FIG. 5, when the lever lock plate 25 is placed in the release position, the restricting part 252 is retracted out of the movement path of the lock pin 244, allowing the switching lever 24 to rotate to the unlocking position.

[0026] The switching lever 24 is further provided with a protruding portion 243 for turning ON the second switch 42. When the switching lever 24 rotates from the locking position to the unlocking position, the protruding portion 243 comes close to the second switch 42, pressing a lever 421 of the second switch 42, turning on the second switch 42. In contrast, when the switching lever 24 rotates from the unlocking position to the locking position, the protruding portion 243 moves away from the second switch 42, turning off the second switch 42. Based on the ON/OFF operation of the second switch 42, it is possible to detect whether the switching lever 24 is located in the locking position or the unlocking position.

[0027] The switching lever 24 has a knob 242 at one of longitudinal ends, which protrudes from the case 21 and is used for manual operation of the switching lever 24. The locking device 20 in the present embodiment is configured such that, when the switching lever 24 is located in the unlocking position, a user is allowed to pinch and flip up the knob 242 to the locking position. The other end opposite the knob 242 relative to the rotary shaft 241 is connected to a plunger 231 of the second solenoid 23 located below via a coupling bar 44.

[0028] The second solenoid 23 is configured such that the plunger 231 protrudes from a frame 232 when power supply is turned off, and the plunger 231 retracts into the frame 232 when power supply is turned on. Since the switching lever 24 is connected to the plunger 231 through the coupling bar 44, the switching lever 24 is rotated about the rotary shaft 241 between the locking position and the unlocking position in association with retraction and protrusion of the plunger 231.

[0029] The hook 26 is provided with an engagement part 261 that engages with a door-side hook 121 of the door 12. The hook 26 is further provided with a rotary shaft 262 above the engagement part 261. The hook 26 rotates between a closed position at

which the engagement part 261 engages with the door-side hook 121 and an open position at which the engagement part 261 disengages the door-side hook 121. The hook 26 shown in FIG. 4 to FIG. 6 is in the closed position and the hook 26 shown in FIG. 7 is in the open position. When the hook 26 is in the closed position and the door 12 is opened, the door-side hook 121 is moved rightward in the figure. This moving door-side hook 121 causes the hook 26 to rotate counterclockwise in the figure to the open position. When the hook 26 is in the open position and the door 12 is further opened, the door-side hook 121 is disengaged from the engagement part 261. On the other hand, while the hook 26 is in the open position, when the door 12 is closed, the door-side hook 121 enters the engagement part 261 of the hook 26 again. As the door 12 is further closed, the door-side hook 121 moving leftward in the figure causes the hook 26 to rotate clockwise in the figure to the closed position.

[0030] The hook 26 is not allowed to rotate from the closed position to the open position while the switching lever 24 is located in the locking position, and the hook hook 26 is allowed to rotate while the switching lever 24 is located in the unlocking position. The details thereof are as below.

[0031] The hook 26 has a lock pin 263. While the switching lever 24 is located in the locking position, the locking lever 27 is located in the path of movement of the lock pin 263 of the hook 26 that attempts to rotate, as shown in FIG. 4 and FIG. 5. Therefore, the hook 26 is not allowed to rotate to the open position (i.e., the door 12 comes into the locked state and cannot be opened). In contrast, when the switching lever 24 is placed in the unlocking position, as shown in FIG. 6, the pressing part 441 of the coupling bar 44 causes the locking lever 27 to rotate about the rotary shaft 271 and move out of the movement path of the lock pin 263. Thus, the hook 26 is allowed to rotate to the open position (i.e., the door 12 comes into the unlocked state and can be opened). Releasing the restriction by the locking lever 27 is performed at the same time when the switching lever 24 is placed in the unlocking position. Thus, detecting by the second switch 42 that the switching lever 24 is placed in the unlocking position

is equivalent to detecting that the restriction by the locking lever 27 is released.

Subsequently, after the door 12 is closed, rotating the hook 26 to the closed position, when the switching lever 24 is placed in the locking position, causing the locking lever 27 to return to its original position by a spring, the hook 26 is not allowed to rotate (i.e., the door 12 is in the locked state and cannot be opened) again. In other words, when the switching lever 24 is located in the unlocking position, the door 12 is in the unlocked state, and when the switching lever 24 is located in the locking position, the door 12 is in the locked state. Rotating the switching lever 24 from the locking position to the unlocking position means switching of the door 12 from the locked state to the unlocked state (a first switching operation), and rotating the switching lever 24 from the unlocking position to the locking position means switching of the door 12 from the unlocked state to the locked state (a second switching operation).

[0032] When the hook 26 is placed in the open position, the lock pin 263 causes the open/close switch lever 28 to rotate about the rotary shaft 271. When the open/close switch lever 28 rotates, an end part (a protruding portion 281) of the open/close switch lever 28, opposite a part contacting with the lock pin 263 relative to the rotary shaft 271, comes close to the first switch 41 and presses a lever 411 of the first switch 41, so that the first switch 41 is turned ON. In contrast, when the hook 26 is placed in the closed position, the open/close switch lever 28 returns to its original position by a spring. That is, the protruding portion 281 moves away from the first switch 41, so that the first switch 41 is turned OFF. Based on the ON/OFF operation of the first switch 41, it is possible to detect whether the hook 26 is located in the open position or the closed position (i.e., whether the door 12 is located in an open state or a closed state).

[0033] (Controller)

Furthermore, the locker apparatus 1 is provided with the controller 51 that controls the locking devices 20 in response to the operation received on the operating unit 30. The controller 51 includes a CPU 511 and a memory 512 as shown in FIG. 2.

The memory 512 stores, for example, a storage program 512a for executing a control when placing baggage into a storage unit 10 and a retrieval program 512b for executing a control when retrieving the baggage from the storage unit 10. The controller 51 is electrically connected to the locking devices 20 and the operating unit 30, and controls the locking devices 20 and displays images on the display unit 32 of the operating unit 30, and other operations, in accordance with the behavior of the storage program 512a or the retrieval program 512b. The controller 51 is connected to a communication unit 52, and thus the locker apparatus 1 can communicate with a management device (not shown) via the communication unit 52. The management device is a higher-level device for the locker apparatus 1, installed in a station yard or at any other location.

[0034] (Operation of storing Baggage)

The locker apparatus 1 configured as above operates as follows for users to store baggage.

[0035] Among a plurality of storage units 10, a storage unit or storage units 10 in which no items are stored (in which a user is allowed to place baggage) are in the standby mode. At that time, the storage unit or storage units 10 in the standby mode are in the locked state. In other words, the corresponding locking device or locking devices 20 are in the state shown in FIG. 4. In this state, the green LED 45 of each locking device 20 is lit and the orange LED 46 is off. The lit green LED 45 indicates to a user that the relevant storage unit 10 is available.

[0036] To store the baggage, the user first performs an acceptance operation for start of use on the operating unit 30. Specifically, for example, a virtual button labeled “Start Use” is displayed on the display unit 32, and the acceptance operation is started when the user touches this virtual button.

[0037] Then, the display unit 32 displays a usage fee, and the user who agrees to the fee by tapping a transportation IC card on the IC card reader 40 to pay the fee. During this payment process, the IC card reader 40 reads the unique number of the IC tag of the IC card and stores this number in the memory 512, so that the stored number

is used for authentication when the baggage is to be retrieved. Upon completion of the payment, the printer 38 prints a receipt as verification of use. The payment method is not limited to a method using an IC card, and may be another method using a credit card or a QR code, or more than one method may be selectively combined. For payment using the QR code, it is necessary to provide a reader for reading a QR code (registered trademark) in the operating unit 30. For payment using a method other than an IC card, it is conceivable to print a code, such as a QR code (registered trademark), on a receipt, and authenticate the user by scanning the printed code. In the locker apparatus 1 in the present embodiment, all the storage units 10 have the same opening width. However, the locker apparatus 1 may be configured such that storage units have different opening widths, and users choose desired opening widths according to their items, and then make payment.

[0038] After the receipt is printed by the printer 38, the storage program 512a runs as below. FIG. 8A and FIG. 8B are flowcharts of the storage program 512a.

[0039] Firstly, among the storage units 10, the green LED 45 of the locking device 20 corresponding to the storage unit 10 available to a user for storing his/her baggage is blinked (step S11 in FIG. 8A). This indicates to the user the position of the storage unit 10 available for storage of the baggage. The orange LED 46 remains turned off.

[0040] Secondly, the first solenoid 22 is energized (step S12 in FIG. 8A), rotating the lever lock plate 25 from the restriction position (the position shown in FIG. 4) to the release position (the position shown in FIG. 5). Whether or not the lever lock plate 25 is placed in the release position is detected by the third switch 43 (step S13 in FIG. 8A).

[0041] When the third switch 43 does not detect that the lever lock plate 25 is located in the release position (step S13: NO in FIG. 8A), indicating that the locking device 20 may have a malfunction, the green LED 45 and the orange LED 46 are blinked (step S131 in FIG. 8A), and an error is displayed on the display unit 32 of the operating unit 30 and the error is notified to a management device via the

communication unit 52 (step S132 in FIG. 8A). The error can be cleared by the management device.

[0042] When the third switch 43 detects that the lever lock plate 25 is located in the release position (step S13: YES in FIG. 8A), the program waits for a standby time of 0.5 second after detection (step S14 in FIG. 8A), and then the second solenoid 23 is energized (step S15 in FIG. 8A), rotating the switching lever 24 from the locking position (the position shown in FIG. 5) to the unlocking position (the position shown in FIG. 6). The above-mentioned standby time of 0.5 second is merely an example.

[0043] Whether or not the switching lever 24 is placed in the unlocking position (whether or not the first switching operation is performed) is detected by the second switch 42 (step S16 in FIG. 8A). When the second switch 42 does not detect that the switching lever 24 is located in the unlocking position (step S16: NO in FIG. 8A), indicating that the locking device 20 may have a malfunction, the green LED 45 and the orange LED 46 are blinked (step S161 in FIG. 8A), and an error is displayed on the display unit 32 of the operating unit 30 and the error is notified to the management device via the communication unit 52 (step S162 in FIG. 8A). The error can be cleared by the management device.

[0044] After the second switch 42 detects that the switching lever 24 is located in the unlocking position (step S16: YES in FIG. 8A), the first switch 41 detects whether or not the door 12 is opened by the user (i.e., whether or not the hook 26 is rotated from the closed position (the position shown in FIG. 6) to the open position (the position shown in FIG. 7) (step S17 in FIG. 8A).

[0045] When the first switch 41 does not detect that the door 12 is opened (step S17: NO in FIG. 8A), the program waits until 60 seconds elapse from detection by the second switch 42 (step S16 in FIG. 8A) (step S171: NO in FIG. 8A). After a lapse of 60 seconds (step S171: YES in FIG. 8A), power supply to the second solenoid 23 is stopped (step S172 in FIG. 8A), placing the switching lever 24 to the locking position and then power supply to the first solenoid 22 is stopped (step S20 in FIG. 8B), placing

the lever lock plate 25 to the restriction position.

[0046] In contrast, when the first switch 41 detects that the door 12 is opened (step S17: YES in FIG. 8A), it is then determined by the first switch 41 whether or not the door 12 is closed by the user (i.e., whether the hook 26 is turned from the open position (the position shown in FIG. 7) to the closed position (the position shown in FIG. 6) (step S18 in FIG. 8A).

[0047] When the first switch 41 does not detect that the door 12 is closed (step S18: NO in FIG. 8A), the program waits until 60 seconds elapse from the detection by the first switch 41 (step S17 in FIG. 8A) as the time required for the user to put the baggage into the storage unit 10 (step S181: NO in FIG. 8A).

[0048] If the door 12 is not closed even after a lapse of 60 seconds (step S181: YES in FIG. 8A), the green LED 45 and the orange LED 46 are blinked (step S182 in FIG. 8A) and the display unit 32 of the operating unit 30 displays an error to prompt the user to close the door 12 (step S183 in FIG. 8A). In the present embodiment, after displaying the error on the display unit 32 of the operating unit 30, the flow returns to step S18 and further waits for. It is however possible to take measures to make the storage unit 10 unavailable.

[0049] When the first switch 41 detects that the door 12 is closed (step 18: YES in FIG. 8A), it is then detected by the second switch 42 whether or not the switching lever 24 is placed in the locking position (i.e., whether or not the second switching operation is manually performed by the user) (step S19 in FIG. 8B).

[0050] For example, if the user forgets to rotate the switching lever 24 to the locking position and the second switch 42 does not detect that the switching lever 24 is located in the locking position (step S19: NO in FIG. 8B), the program waits until 60 seconds elapse from the detection by the first switch 41 (step S18 in FIG. 8B) (step S191: NO in FIG. 8B). After a lapse of 60 seconds (step S191: YES in FIG. 8B), power supply to the second solenoid 23 is stopped (step S192 in FIG. 8B), forcibly turning the switching lever 24 from the unlocking position (the position shown in FIG.

6) to the locking position (the position shown in FIG. 5). Setting the standby time of 60 seconds (step S191 in FIG. 8B) can provide a grace period for a user to take in and out baggage, and forcibly turning the switching lever 24 to the locking position (forcibly performing the second switching operation) can prevent the switching lever 24 from being left unlocked by a user.

[0051] Whether or not the switching lever 24 forcibly operated is placed in the locking position is detected by the second switch 42 (step S193 in FIG. 8B).

[0052] When the second switch 42 does not detect that the switching lever 24 is placed in the unlocking position (step S193: NO in FIG. 8B), indicating that the locking device 20 has any malfunction, the green LED 45 and the orange LED 46 are blinked (step S194 in FIG. 8B), and an error is displayed on the display unit 32 of the operating unit 30 and the error is notified to the management device via the communication unit 52 (step S195 in FIG. 8B). The error can be cleared by the management device.

[0053] After the second switch 42 detects that the switching lever 24 is located in the unlocking position (step S193: YES in FIG. 8B), power supply to the first solenoid 22 is stopped (step S20), moving the lever lock plate 25 from the release position (the position shown in FIG. 5) to the restriction position (the position shown in FIG. 4).

[0054] When the user rotates the switching lever 24 to the locking position and the second switch 42 detects that the switching lever 24 is located in the locking position (step S19: YES in FIG. 8B), power supply to the first solenoid 22 is also stopped (step S20 in FIG. 8B), moving the lever lock plate 25 to the restriction position.

[0055] Subsequently, the green LED 45 is turned off and the orange LED 46 is turned on (step S21 in FIG. 8B), and the program waits for 900 seconds (step S22 in FIG. 8B). This period of 900 seconds is a standby time for receiving a re-unlocking operation of switching the door 12 from the locked state to the unlocked state again, for example, if a user has forgotten to put baggage into the storage unit 10. The lit orange LED 46 provides notification to the user that the re-unlocking operation is

available. This re-unlocking operation can be received on the operating unit 30.

[0056] During the standby time of 900 seconds (step S22: NO in FIG. 8B), when the operating unit 30 receives the re-unlocking operation (step S221: YES in FIG. 8B), the orange LED 46 is blinked (step S223 in FIG. 8B) to notify the user of the storage unit 10 to be re-unlocked. Thereafter, the flow returns to step S12 in which the first solenoid 22 is energized, and the same processing (step S12 to S21) is performed as in the flow for storing baggage. To prevent unauthorized third parties from re-unlocking the door 12 without permission, it is desirable to authenticate the user when the operation is accepted on the operating unit 30. Specifically, for example, the IC card that was used for payment could be used for authentication of the user.

[0057] When the re-unlocking operation is not performed (step S221: NO in FIG. 8B) and 900 seconds elapse (step S22: YES in FIG. 8B), the orange LED 46 is turned off (step S23 in FIG. 8B). Then, the storage unit 10 is switched to the storage mode in which the storage unit 10 is on standby with the baggage stored therein (step S24 in FIG. 8B), and the storage program terminates. The locking device 20 of the storage unit 10 in the storage mode has the green LED 45 and the orange LED 46 both turned off, indicating that the relevant storage unit 10 is not available to other users.

[0058] (Operation of Retrieving Baggage)

Next, the operation of retrieving the baggage will be described below. To retrieve baggage from a storage unit 10, a user first performs an acceptance operation for retrieval on the operating unit 30. Specifically, for example, the display unit 32 displays a virtual button labeled “Retrieve”, and the acceptance operation is started when the user touches this virtual button.

[0059] Then, authentication is performed using the IC card that was used for payment. When the authentication is successfully completed, the retrieval program 512b starts to run as below. FIG. 9A and FIG. 9B are flowcharts of the retrieval program 512b.

[0060] Firstly, among the plurality of storage units 10, the orange LED 46 of the

locking device 20 corresponding to the storage unit 10 that holds the baggage of the user is blinked (step S31 in FIG. 9A). This indicates the position of the storage unit 10 holding the baggage of the user. The green LED 45 remains turned off.

[0061] Secondly, the first solenoid 22 is energized (step S32 in FIG. 9A), rotating the lever lock plate 25 from the restriction position to the release position. Whether or not the lever lock plate 25 is placed in the release position is detected by the third switch 43 (step S33 in FIG. 9A).

[0062] When the third switch 43 does not detect that the lever lock plate 25 is placed in the release position (step S33: NO in FIG. 9A), indicating that the locking device 20 may have a malfunction, the green LED 45 and the orange LED 46 are blinked (step S331 in FIG. 9A), and an error is displayed on the display unit 32 of the operating unit 30 and the error is notified to a management device via the communication unit 52 (step S332 in FIG. 9A). The error can be cleared by the management device.

[0063] When the third switch 43 detects that the lever lock plate 25 is located in the release position (step S33: YES in FIG. 9A), the program waits for a standby time of 0.5 second after detection (step S34 in FIG. 9A), and then the second solenoid 23 is energized (step S35 in FIG. 9A), rotating the switching lever 24 from the locking position to the unlocking position. The above-mentioned standby time of 0.5 second is merely an example.

[0064] Whether or not the switching lever 24 is placed in the unlocking position is detected by the second switch 42 (step S36 in FIG. 9A). When the second switch 42 does not detect that the switching lever 24 is located in the unlocking position (step S36: NO in FIG. 9A), indicating that the locking device 20 may have a malfunction, the green LED 45 and the orange LED 46 are blinked (step S361 in FIG. 9A), an error is displayed on the display unit 32 of the operating unit 30 and the error is notified to the management device via the communication unit 52 (step S362 in FIG. 9A). The error is cleared by the management device.

[0065] After the second switch 42 detects that the switching lever 24 is located in the unlocking position (step S36: YES in FIG. 9A), the first switch 41 detects whether or not the door 12 is opened by the user (i.e., whether or not the hook 26 is rotated from the closed position to the open position) (step S37 in FIG. 9A).

[0066] When the first switch 41 does not detect that the door 12 is opened (step S37: NO in FIG. 9A), the program waits until 60 seconds elapse from detection by the second switch 42 (step S36 in FIG. 9A) (step S371: NO in FIG. 9A). After a lapse of 60 seconds (step S371: YES in FIG. 9A), the green LED 45 is turned off and the orange LED 46 is turned on (step S39 in FIG. 9B), and further power supply to the second solenoid 23 is stopped (step S40 in FIG. 9B), automatically placing the switching lever 24 to the locking position.

[0067] In contrast, when the first switch 41 detects that the door 12 is opened (step S37: YES in FIG. 9A), the first switch 41 then detects whether or not the door 12 is closed by the user (i.e., whether or not the hook 26 is rotated from the opened position to the closed position) (step S38 in FIG. 9A).

[0068] When the first switch 41 does not detect that the door 12 is closed (step S38: NO in FIG. 9A), the program waits until 60 seconds elapse from detection by the second switch 42 (step S37 in FIG. 9A) so that the user removes the baggage from the storage unit (step S381: NO in FIG. 9A).

[0069] If the door 12 is not closed even after a lapse of 60 seconds (step S381: YES in FIG. 9A), the green LED 45 and the orange LED 46 are blinked (step S382 in FIG. 9A) and the display unit 32 of the operating unit 30 displays an error to prompt the user to close the door 12 (step S383 in FIG. 9A). In the present embodiment, the flow returns to step S38 after displaying the error on the display unit 32 of the operating unit 30 and further waits for; however, measures can be taken to make the storage unit 10 unavailable.

[0070] When the first switch 41 detects that the door 12 is closed (step S38: YES in FIG. 9A), the green LED 45 is turned off and the orange LED 46 is turned on (step

S39 in FIG. 9B). Then, power supply to the second solenoid 23 is stopped (step S40 in FIG. 9B), automatically placing the switching lever 24 to the locking position.

[0071] Whether or not the switching lever 24 is placed in the locking position is detected by the second switch 42 (step S41 in FIG. 9B).

[0072] When the second switch 42 does not detect that the switching lever 24 is placed in the unlocking position (step S41: NO in FIG. 9B), indicating that the locking device 20 may have a malfunction, the green LED 45 and the orange LED 46 are blinked (step S411 in FIG. 9B), and an error is displayed on the display unit 32 of the operating unit 30 and the error is notified to a management device via the communication unit 52 (step S412 in FIG. 9B). The error can be cleared by the management device.

[0073] After the second switch 42 detects that the switching lever 24 is located in the unlocking position (step S41: YES in FIG. 9B), the program waits for 30 seconds (step S42 in FIG. 9B). This standby time is the time during which a user is allowed to manually turn the switching lever 24 to the unlocking position to switching the door 12 to the unlocked state, for example, if the user has forgotten to remove the baggage from the storage unit 10.

[0074] During a standby time of 30 seconds (step S42: NO in FIG. 9B), when the second switch 42 detects that the switching lever 24 is located in the unlocking position, that is, when the user manually turns the switching lever 24 to the unlocking position (step S43: YES in FIG. 9B), the flow returns to step S37.

[0075] After a lapse of the standby time of 30 seconds (step S42: YES in FIG. 9B), power supply to the first solenoid 22 is stopped (step S44 in FIG. 9B), moving the lever lock plate 25 to the restriction position. Thus, the switching lever 24 is not allowed to be manually placed to the unlocking position.

[0076] Whether or not the lever lock plate 25 is located in the restriction position is detected by the third switch 43 (step S45 in FIG. 9B).

[0077] When the third switch 43 does not detect that the lever lock plate 25 is

located in the restriction position (step S45: NO in FIG. 9B), indicating that the locking device 20 may have a malfunction, the green LED 45 and the orange LED 46 are blinked (step 451 in FIG. 9B), and an error is displayed on the display unit 32 of the operating unit 30 and the error is notified to a management device via the communication unit 52 (step S452 in FIG. 9B). The error can be cleared by the management device.

[0078] When the third switch 43 detects that the lever lock plate 25 is located in the restriction position (step S45: YES in FIG. 9B), the program waits for a standby time of 60 seconds (step S46 in FIG. 9B). This period of 60 seconds is the standby time for receiving the re-unlocking operation to switch the door 12 from the locked state to the unlocked state again, for example, if the user has forgotten to remove the baggage from the storage unit 10. This re-unlocking operation can be received on the operating unit 30.

[0079] During the standby time of 60 seconds (step S46: NO in FIG. 9B), when the operating unit 30 receives the re-unlocking operation (step S461: YES in FIG. 9B), the flow returns to step S31, and the same processing (step S31 to S45) is performed as in the flow for retrieving baggage. To prevent unauthorized third parties from re-unlocking the door 12 without permission, it is desirable to authenticate the user when the operation is accepted on the operating unit 30. Specifically, for example, the IC card that was used for payment could be used for authentication of the user.

[0080] When the re-unlocking operation is not performed (step S461: NO in FIG. 9B) and 60 seconds elapse (step S46: YES in FIG. 9B), the green LED 45 is turned on and the orange LED 46 is turned off (step S47 in FIG. 9B). Then, the storage unit 10 is switched to the standby mode in which the storage unit 10 is on standby with no baggage stored therein (step S48 in FIG. 9B), and the retrieval program terminates.

[0081] (Emergency Unlocking of Locking Device)

While the storage unit 10 is in the standby mode, the locking device 20 continuously keeps the door 12 in the locked state. However, in emergency situations,

the door 12 can be unlocked using an emergency key 61 (see FIG. 10). FIG. 10 is a cross-sectional view of the locking device 20, similar to FIG. 4, showing a state in which emergency unlocking is performed. FIG. 11A is a cross-sectional view taken along a line C-C in FIG. 10, showing a normal usage state of the locking device 20. FIG. 11B is a cross-sectional view taken along the line C-C in FIG. 10, showing a state in which the locking device 20 is subjected to emergency unlocking. FIG. 11C is a cross-sectional view taken along the line C-C in FIG. 10, showing a state in which the locking device 20 can be removed from the casing frame 11.

[0082] The locking device 20 includes, as shown in FIG. 4, a cylinder cam 62 in the upper part of the case 21. The cylinder cam 62 can be rotated with the emergency key 61. Furthermore, an emergency unlocking cam 63 is provided adjacent to the first solenoid 22 in the case 21.

[0083] The cylinder cam 62 is rotatable between a first position (the position shown in FIG. 11A) which is a normal position, a second position (the position shown in FIG. 11B) for performing emergency unlocking, and a third position (the position shown in FIG. 11C) for removing the locking device 20 from the casing frame 11.

[0084] The cylinder cam 62 includes a come-off stopper part 621 for preventing the locking device 20 from coming off the casing frame 11, as shown in FIG. 4. When the cylinder cam 62 is in the first position, the come-off stopper part 621 protrudes above the upper end face of the case 21 (see FIG. 4 or FIG. 11A). Accordingly, even if an attempt is made to remove the locking device 20 from the casing frame 11, the come-off stopper part 621 comes into contact with the back side of the casing frame 11, thereby preventing the locking device 20 from coming off the casing frame 11.

[0085] The cylinder cam 62 includes an extension part 622 extending from the come-off stopper part 621 to the inside of the case 21 as shown in FIG. 4. The extension part 622 has a tip serving as a cam part 622a for activating the emergency unlocking cam 63. The cam part 622a is inclined toward the rear right side in FIG. 4 (toward the rear left side in FIGs. 11A-C).

[0086] The emergency unlocking cam 63 is rotatable about the central axis 631 within the case 21, between the normal position shown in FIG. 4 and the emergency unlocking position shown in FIG. 10. The emergency unlocking cam 63 includes a contact part 632 provided to be able to contact with the cam part 622a. This contact part 632 is formed of a surface inclined in the same direction as the cam part 622a. Furthermore, the emergency unlocking cam 63 includes a pressing part 633 on the end opposite the contact part 632 relative to the central axis 631. The pressing part 633 can contact with a protruding portion 253 provided on the upper end of the lever lock plate 25.

[0087] With the foregoing configuration, emergency unlocking will be performed as below. When the emergency key 61 is inserted in the keyhole 60 and turned 45° counterclockwise (clockwise in FIGs. 11A-C), the cylinder cam 62 is also rotated 45° from the first position to the second position. At that time, the cam part 622a of the cylinder cam 62 comes into contact with the contact part 632 of the emergency unlocking cam 63. Since both the cam part 622a and the contact part 632 are inclined, the emergency unlocking cam 63 is rotated from the normal position toward the emergency unlocking position as the cylinder cam 62 is rotated. When the emergency unlocking cam 63 is rotated to the emergency unlocking position, the pressing part 633 presses the protruding portion 253 of the lever lock plate 25, thereby rotating the lever lock plate 25 from the restriction position to the release position. Once the lever lock plate 25 is placed in the release position, the switching lever 24 can be manually turns to the unlocking position, enabling the door 12 to be opened.

[0088] After emergency unlocking is performed, when the emergency key 61 is rotated 90° clockwise (counterclockwise in FIGs. 11A-C), the cylinder cam 62 is also rotated 90° from the second position to the third position. Then, the come-off stopper part 621 of the cylinder cam 62 is located below the upper end face of the case 21 as shown in FIG. 11C, allowing the locking device 20 to be removed from the casing frame 11. This removal of the locking device 20 from the casing frame 11 must be

performed only after emergency unlocking is performed. This is because, unless emergency unlocking is done, the hook 26 remains engaged with the door-side hook 121 of the door 12 and thus the locking device 20 cannot be removed.

[0089] (Door Opening/Closing Direction)

The locking device 20 can be used for either a left-hand door 12 or a right-hand door 12 according to the orientation of a handing change piece 47 attached to the front of the case 21. FIG. 12 is a front view of the locking device 20 corresponding to the right-hand door 12.

[0090] The handing change piece 47 is a nearly rectangular component with its longitudinal direction parallel to the horizontal direction when viewed from the front of the case 21, as shown in FIG. 3 or FIG. 12. The handing change piece 47 has an opening 47a at one of ends in the longitudinal direction to allow the door 12 to enter the case 21. As shown in FIG. 3, when the handing change piece 47 is attached to the case 21 so that the opening 47a is positioned on the left side in a front view, the handing change piece 47 is adaptable to the left-hand door 12 (e.g., the door 12 of the storage unit 10 located on the left side of the operating unit 30 in FIG. 1). On the other hand, as shown in FIG. 12, when the handing change piece 47 is attached to the case 21 so that the opening 47a is positioned on the right side in the front view, the handing change piece 47 is adaptable to the right-hand door 12 (e.g., the door 12 of the storage unit 10 located on the right side of the operating unit 30 in FIG. 1).

[0091] The handing change piece 47 can be used for either the left-hand door 12 or the right-hand door 12 depending on the orientation as above because the hook 26 has the following shape. The details thereof will be described below referring to FIGs. 13A-C. FIG. 13A is a left side view of the hook 26. FIG. 13B is a front view of the hook 26. FIG. 13C is a right side view of the hook 26.

[0092] The hook 26 includes a first hook part 264 located on the left side in the front view, a second hook part 265 located on the right side in the front view, and a connecting part 266 laterally connecting the first hook part 264 and the second hook

part 265, as shown in FIGs. 13A-C. The connecting part 266 laterally extends between the rear ends of the first hook part 264 and the second hook part 265 in the front view, so that the hook 26 has a nearly reversed U-shape in a plan view. The first hook part 264 and the second hook part 265 each have an engagement part 261.

[0093] The hook 26 configured as above is installed in the case 21 so that the first hook part 264 is positioned on the left side of the case 21 in the front view and the second hook part 265 is positioned on the right side of the case 21 as shown in FIG. 3 and FIG. 12. In addition, as shown in FIG. 3, when the handing change piece 47 is attached to the case 21 so that the opening 47a is positioned on the left side in the front view, the hook door-side 121 of the left-hand door 12 enters the case 21 through the opening 47a, and engages with the engagement part 261 of the first hook part 264. On the other hand, as shown in FIG. 12, when the handing change piece 47 is attached to the case 21 so that the opening 47a is positioned on the right side in the front view, the door-side hook 121 of the right-hand door 12 enters the case 21 through the opening 47a, and engages with the engagement part 261 of the second hook part 265.

[0094] As described above, the storage apparatus in the present embodiment is characterized in (1) the storage apparatus (e.g., the locker apparatus 1) including the storage units 10 capable of storing items, the doors 12 for opening and closing the storage units 10, the locking devices 20 each capable of performing the first switching operation of switching from the locked state to lock the corresponding door 12 to the unlocked state to unlock the corresponding door 12 and the second switching operation of switching from the unlocked state to the locked state, the operating unit 30 that receives operations by users, and the controller 51 that controls the locking devices 20 in response to the operation received on the operating unit 30. The storage units 10 each have the standby mode of waiting with no item stored in the storage unit 10 and the storage mode of waiting with items stored in the storage unit 10. During the standby mode, the doors 12 are in the locked state.

[0095] (2) The storage apparatus (the locker apparatus 1) described in (1) is

preferably configured as below. The locking device 20 includes the restricting means (e.g., the lever lock plate 25) that implements restriction of the first switching operation in the locked state, the first drive means (e.g., the first solenoid 22) that drives the restricting means (the lever lock plate 25) to implement or release the restriction, and the second drive means (e.g., the second solenoid 23) for performing the first switching operation. The storage apparatus includes the first detecting means (e.g., the first switch 41) that detects the open/closed state of the door 12 and the second detecting means (e.g., the second switch 42) that detects that the second switching operation is performed. The controller 51 stores the storage program 512a configured as below. During the standby mode, when the operating unit 30 receives an operation for entering the storage mode, the first drive means (the first solenoid 22) is activated to release the restriction by the restricting means (the lever lock plate 25) (step S12) and the second drive means (the second solenoid 23) is activated to perform the first switching operation (step S15). When the first detecting means (the first switch 41) detects that the door 12 is closed (step S18: YES) and the second detecting means (the second switch 42) detects that the second switching operation is performed (step S19: YES or step S193: YES), the first drive means (the first solenoid 22) is activated to implement the restriction by the restricting means (the lever lock plate 25) (step S20) and also, until the first predetermined time (e.g., 900 seconds (step S22)) elapses, the re-unlocking operation for releasing the restriction by the first drive means (the first solenoid 22) and causing the second drive means (the second solenoid 23) to perform the first switching operation again (step S221) can be received on the operating unit 30. When the first predetermined time elapses (step S22: YES), the re-unlocking operation cannot be received, and the storage unit 10 is switched to the storage mode (step S24).

[0096] (3) In the storage apparatus (the locker apparatus 1) described in (2), preferably, the second drive means (the second solenoid 23) is able to perform the second switching operation, and the storage program 512a is configured such that,

after a lapse of the second predetermined time (e.g., 60 seconds) (step S191: YES) from when the first detecting means (the first switch 41) detects that the door 12 is closed (step S18: YES), the second drive means (the second solenoid 23) is activated to perform the second switching operation (step S192).

[0097] (4) The storage apparatus (the locker apparatus 1) described in (1) is preferably configured as below. The locking device 20 includes the restricting means (e.g., the lever lock plate 25) that implements restriction of the first switching operation in the locked state, the first drive means (e.g., the first solenoid 22) that drives the restricting means (the lever lock plate 25) to implement or release the restriction, and the second drive means (e.g., the second solenoid 23) for performing the first switching operation and the second switching operation. The storage apparatus includes the first detecting means (e.g., the first switch 41) that detects the open/closed state of the door 12 and the second detecting means (e.g., the second switch 42) that detects that the second switching operation is performed. The controller 51 stores the retrieval program 512b configured as below. During the storage mode, when the operating unit 30 receives an operation for retrieving the item, the first drive means (the first solenoid 22) is activated to release the restriction by the restricting means (the lever lock plate 25) (step S32) and the second drive means (the second solenoid 23) is activated to perform the first switching operation (step S35). When the first detecting means (the first switch 41) detects that the door 12 is closed (step S38: YES), the second drive means (the second solenoid 23) is activated to perform the second switching operation (step S40), and the first switching operation is enabled to be manually performed from when the second detecting means (the second switch 42) detects that the second switching operation is performed (step S41) until the third predetermined time (e.g., 30 seconds (step S42)) elapses.

[0098] (5) The storage apparatus (the locker apparatus 1) described in (4) is preferably configured as below. The retrieval program 512b is configured as below. When the third predetermined time elapses (step S42: YES), the first drive means (the

first solenoid 22) is activated to implement the restriction by the restricting means (the lever lock plate 25) (step S44) and the re-unlocking operation (step S461) can be received to release the restriction by the first drive means (the first solenoid 22) and cause the second drive means (the second solenoid 23) to perform the first switching operation again until the fourth predetermined time (e.g., 60 seconds (step S46)) elapses. When the fourth predetermined time elapses (step S46: YES), the re-unlocking operation cannot be received and the storage unit 10 is switched to the standby mode (step S48).

[0099] In the above-described storage apparatus (the locker apparatus 1), the door 12 is in the locked state during the standby mode of the storage unit 10, making it possible to prevent inappropriate use of the storage unit 10 on standby.

[0100] The foregoing embodiments are merely examples and give no limitation to the present invention. The present invention may be embodied in other specific forms without departing from the essential characteristics thereof.

[0101] For instance, users who place items into the locker apparatus 1 and users who retrieve the items from the locker apparatus 1 are not always the same persons. Specifically, in recent years, railway stations are widely regarded as physical distribution hubs, and it is conceivable that transport companies that deliver goods ordered by general consumers will become users who drop off articles or goods, and the general consumers who ordered the goods will become users who pick up the articles or goods. In this case, for example, a specific transport company is permitted in advance to use the locker apparatus 1, and the storage program is executed after the transport company is authenticated via the operating unit 30. The authentication for pickup of the articles or goods is performed, for example, in a manner that an authentication code such as a QR code (registered trademark) is transmitted in advance to a mobile device or the like of the general consumer, and the retrieval program is executed after the authentication code is authenticated.

[0102] Furthermore, for example, the locker apparatus installed in a station is

shown as one example of the storage apparatus; however, the storage apparatus is not limited thereto and may be a delivery locker installed in an apartment building, etc.

REFERENCE SIGNS LIST

[0103]

1	Locker apparatus (one example of Storage apparatus)
10	Storage unit
12	Door
20	Locking device
30	Operating unit
51	Controller

CLAIMS

1. A storage apparatus (1) comprising:

a storage unit (10) capable of storing an item;

a door (12) for opening and closing the storage unit (10);

a locking device (20) capable of performing a first switching operation of switching from a locked state in which the door (12) is locked to an unlocked state in which the door (12) is unlocked and a second switching operation of switching from the unlocked state to the locked state;

an operating unit (30) that receives an operation by a user; and

a controller (51) that controls the locking device (20) in response to the operation received on the operating unit (30),

characterized in that

the storage unit (10) has a standby mode (S48) of waiting with no item stored in the storage unit (10) and a storage mode (S24) of waiting with an item stored in the storage unit (10), and

the door (12) is in the locked state during the standby mode (S48).

2. The storage apparatus (1) according to claim 1, wherein

the locking device (20) includes restricting means (25) that implements restriction of the first switching operation in the locked state, first drive means (22) that drives the restricting means (25) to implement or release the restriction, and second drive means (23) for performing the first switching operation,

the storage apparatus (1) includes first detecting means (41) that detects an open/closed state of the door (12) and second detecting means (42) that detects that the second switching operation is performed,

the controller (51) stores a storage program (512a) configured to:

activate the first drive means (22) to release the restriction by the restricting means (25) and activate the second drive means (23) to perform the first

switching operation, when the operating unit (30) receives an operation for entering the storage mode (S24) during the standby mode (S48);

activate the first drive means (22) to implement the restriction by the restricting means (25) when the first detecting means (41) detects that the door (12) is closed and the second detecting means (42) detects that the second switching operation is performed, and, until a first predetermined time elapses (S22), enable the operating unit (30) to receive a re-unlocking operation for releasing the restriction by the first drive means (22) and causing the second drive means (23) to perform the first switching operation again; and

disable the re-unlocking operation from being received when the first predetermined time elapses (S22), and switch the storage unit (10) to the storage mode (S24).

3. The storage apparatus (1) according to claim 2, wherein

the second drive means (23) is able to perform the second switching operation, and

the storage program (512a) is configured to activate the second drive means (23) to perform the second switching operation after a second predetermined time elapses (S191) from when the first detecting means (41) detects that the door (12) is closed.

4. The storage apparatus (1) according to claim 1, wherein

the locking device (20) includes restricting means (25) that implements restriction of the first switching operation in the locked state, first drive means (22) that drives the restricting means (25) to implement or release the restriction, and second drive means (23) for performing the first switching operation,

the storage apparatus (1) includes first detecting means (41) that detects an open/closed state of the door (12) and second detecting means (42) that detects that

the second switching operation is performed,

the controller (51) stores a retrieval program (512b) configured to:

activate the first drive means (22) to release the restriction by the restricting means (25) and activate the second drive means (23) to perform the first switching operation, when the operating unit (30) receives an operation for retrieving the item during the storage mode (S24); and

activate the second drive means (23) to perform the second switching operation when the first detecting means (41) detects that the door (12) is closed, and enable the first switching operation to be manually performed until a third predetermined time elapses (S42) from when the second detecting means (42) detects that the second switching operation is performed.

5. The storage apparatus (1) according to claim 4, wherein

the retrieval program (512b) is configured to:

activate the first drive means (22) to implement the restriction by the restricting means (25) when the third predetermined time elapses (S42), enable the operating unit (30) to receive a re-unlocking operation for releasing the restriction by the first drive means (22) and causing the second drive means (23) to perform the first switching operation again, until a fourth predetermined time elapses (S46); and

disable the re-unlocking operation from being received when the fourth predetermined time elapses (S46), and switch the storage unit (10) to the standby mode (S48).